# IDOT Process for HMI Development

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# Topics

- **Understand the Users Need**
- **Allocate HMI Components**
- **Prototype the Design**
- **Solicit Usability Group Feedback**
- **Iterative Design**
- **Basic HMI Principles as Applied to PTC**
- **Lockheed Martin HMI Activity**

# Understand the Users Need

- **Study PTC Concept of Operations and Requirements**
  - **Differentiate role of the Locomotive Engineer versus the System**
- **Interview End Users and System Engineers**
- **Leverage Lessons learned from Other CBT Systems and NAJPTC Workshops**
- **Apply lessons learned from past Lockheed HMI development**

# Allocate HMI Components

- **Allocate Stable PTC System Requirements to specific HMI**
  - **Segregate Critical Display and Control Elements**
  - **Associate HMI requirements with Operator Tasks**
- **Standardize Display Components and Behavior**
  - **Meet PTC Standards and interoperability Objectives (e.g ATCS 320 and LSI M591)**
  - **Design standardized component templates**
    - **Ensure component look, feel and behavior that fits requirements without degrading overall usability**
    - **Standardize when appropriate**

# Design Prototyping

- Initiate rapid prototyping during requirements development phase
  - Stay within open systems model for smooth transition to final design (e.g. POSIX compliance)
  - Design for system and user task growth
- Employ Graphical User Interface (GUI) Tools with Automated Code Generation
  - Get the graphics in place first
  - Use Reliable Software Vendor

# Usability Group Feedback

- **Establish Multi-disciplined Usability Group Early in Conceptual Design Phase**
  - **Obtain feedback in prototype design from systems/software/operability engineering, and experienced "end users"**
  - **Obtain feedback from train crews during design phases (i.e. Field Testing).**
- **Facilitate Design Decisions Quickly and Firmly**
  - **Maintain prototype design rhythm**
    - **Don't get hung up on looking for the perfect solution "Incremental Improvement vice Deferred Perfection"**
  - **Allow room for compromise and growth**

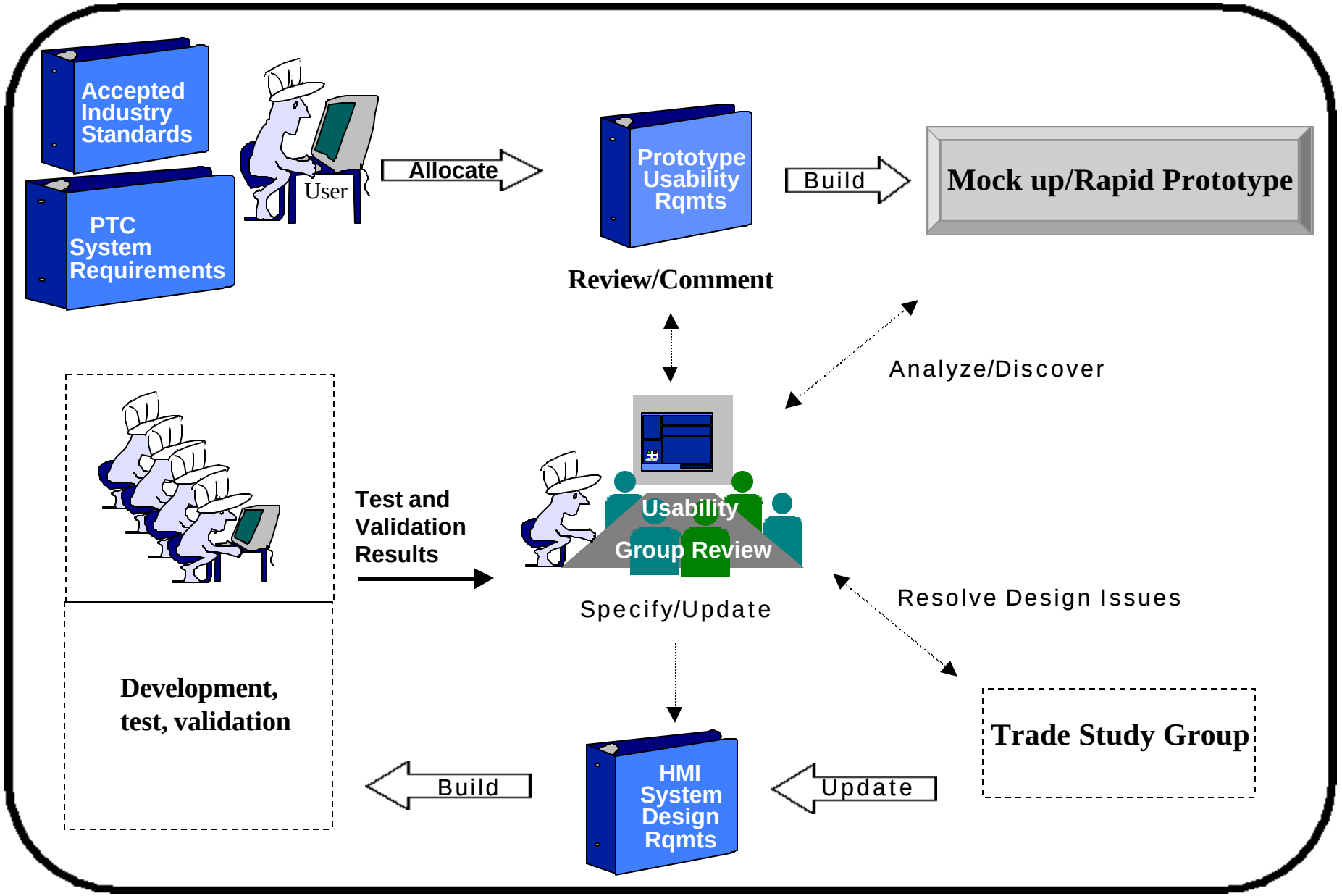
# Iterative Process

- Refine Displays with initial Usability group feedback
- Integrate/Exercise Scenarios with Prototype Displays
  - Develop user models for performance benchmarking
  - Update Prototype displays and scenarios as required
- Employ  Usability Evaluation Process as Required
  - Identify inadvertent obstacles to human intuition
  - Perform Design trade-off study as required
  - Consult with human engineering experts as required
- Re-introduce to Usability group prior to baseline Design

# Basic HMI Principles as Applied to PTC

- Do not compromise user friendliness
  - Keep it Simple, Useful, and Safe
  - Common components and behavior
- Users are not good at discerning changes in display data
  - Use Graphics for the big picture and never cover critical display
  - Use discernible audio for alerts requiring immediate action
- Define system automation boundaries
  - Rely on operator for primary train control and supervision of automation control
  - Give operator sufficient data to supplement normal train operations as well as make intelligent decisions when to bypass automation
- Fail Operationally

# Iterative HMI Process



# Lockheed HMI related PTC Activity

- **Allocation of HMI PTC system requirements (Version 3.0) complete**
- **Rail Architecture Investigation Lab (RAIL) established**
  - **Rapid Prototyping of Loco and Remote Office displays in preliminary stage**
- **Usability group review planned for first quarter of 2001**
- **Trade Study of ATCS spec 320 requirements and PTC HMI requirements schedule in early first quarter of 2001**